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THE PRODUCTION IN MONKEYS OF ANTIBODIES FOR HUMAN CORPUSCLES.*

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In the course of certain experiments on measles and other diseases in the monkey¹ the opportunity was used to follow the development in the monkey of antibodies to human blood corpuscles. Uhlenhuth and Weidanz² assert that the injection of human serum in monkeys (*Cercopithecus fuliginosus* and *Macacus rhesus*) results in the formation of specific precipitins, but I am not aware that any observations have been recorded on the development in the monkey of antibodies to human corpuscles. My observations were made on five monkeys (*Macacus rhesus*) injected with human blood as follows: Monkey 1 received 3 c.c. of human blood into the heart, Monkey 5, 3 c.c. into the peritoneal cavity, Monkeys 7 and 8, 30 c.c. into the heart, and Monkey 9, 30 c.c. into the peritoneal cavity. The forms of antibody action detected were agglutination and, in the case of Monkey 5, opsonification. The agglutinative mixtures were in quantity 0.6 c.c.; of this, 0.2 c.c. was a 5 per cent suspension of washed human corpuscles, the rest, monkey serum and salt solution. The opsonic mixtures were made in the same way with the addition of washed monkey leukocytes obtained from exudates produced by the injection of suspensions of aleuronat into the pleural cavity, the total quantity here also being 0.6 c.c. The smears were made after an incubation at 37° C. for one hour.

There was no phagocytosis in similar mixtures in which human leukocytes were substituted for leukocytes from the monkey.

The heated serum of these monkeys in quantities of 0.2 c.c., complemented either with fresh monkey serum or with guinea-pig

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¹ Hektoen and Eggers, *Jour. Am. Med. Assn.*, 1912, 47, p. 1833.

² *Handbuch der Technik und Methodik der Immunitätsforschung*, 1909, 2, p. 781.

Since writing this article Berkeley reports that *Macacus rhesus* and certain Java monkeys immunized with human, horse, or dog serum do not form antibodies demonstrable by either the precipitin reaction or the reaction of fixation. (Hugh K. Berkeley, *Univ. Cal. Publications in Pathology*, 1913, 2, p. 105).

serum (0.0125 c.c.), did not cause any lysis of human corpuscles (0.2 c.c. of a 5 per cent suspension). No tests for precipitin were made.

The results as to agglutination are given in Table I.

TABLE I.
AGGLUTINATION OF HUMAN CORPUSCLES BY THE SERUM OF MONKEYS INJECTED WITH HUMAN BLOOD.

Days after Injection	Monkey 1. 3 c.c. of Human Blood in Heart	Monkey 5. 3 c.c. of Human Blood Intrapер.	Monkey 7. 30 c.c. of Hu- man Blood in Heart	Monkey 8. 30 c.c. of Hu- man Blood in Heart	Monkey 9. 30 c.c. of Hu- man Blood In- traper.
2			o	o	o
3			o	o	o
4			o	o	o
5			o	o	o
6			o	o	o
7			6	12	6
8	192	48	24	12	6
9	384	48	24	12	24
10				12	12
11	384	48	12	12	12
12	384	48	12	12	12
13	384	48	o	12	12
14	384	48	o	o	12
15	384		o	o	o
16	192	48	o	o	o
17					
18					
19		48			

The figures represent the highest dilution of the monkey serum giving agglutination.

In some instances the same results were obtained with corpuscles from five different persons of different isoagglutinative groups, showing that the agglutination did not depend on any individual peculiarity of the corpuscles.

Inspection of Table I shows that the highest agglutinative strength developed in the serum of Monkey 1, which received 3 c.c. of human blood into the heart. Unfortunately the day of the earliest appearance of agglutinin in the blood was not determined in this case. In the other animals the agglutinin content was not nearly so high and in those injected with 30 c.c. of human blood the period of latency was rather long, the first appearance of agglutinin being on the seventh day. This result is in harmony with the experience that, in general, large doses of antigen do not necessarily give the largest output of antibodies.

In Monkey 5 the opsonin strength of the serum was tested on the same day as the agglutinin; the extinction occurred uniformly in dilutions of 1 to 12.

The results of these observations indicate that in the monkey, injections of human blood stimulate the formation of agglutinin and opsonin for human corpuscles, these antibodies describing the same sort of a curve, tho of small range, as other antibodies after the injection of a single dose of antigen. If we may judge from just one or two instances, the injection of monkeys with comparatively small quantities of human blood gives a larger response than injections of large quantities.

The fact that monkeys respond in this way to human blood might be taken advantage of in differentiating between human and monkey blood, but self-evidently this would be possible only under very special conditions, so that the method would seem to have an extremely limited practical significance.